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# Ancient Iron Smelting in Nathara-Ki-Pal, Southeast Rajasthan

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Archaeometallurgy is the study of metal working structure, tools, waste products and finished metal artifacts from the Bronze Age to the recent past. It can be used to identify and interpret metal working structure in the field and during the post-excavation phases of a project, metal working waste product such as slags, crucible and moulds. The technologies used in the past can be reconstructed from the information obtained. Scientific techniques are often used by archaeometallurgy, as they can provide additional information.<sup>1</sup> In South Asia, there have been few studies on Archaeometallurgy, reason being a lack of easily accessible laboratories for scientific studies on the same. There is also a lack of adequate communication between archaeologists and scientists working in the field of the metal technology as also with communities practicing traditional techniques of iron-working. Despite such problems important studies have been conducted by some scholars.<sup>2</sup>

The study region falls within the modern state of Rajasthan. The antiquity of iron in Rajasthan dates back to around 1<sup>st</sup> millennium BCE. The sites namely Noh (Bharatpur) provides evidence of it;<sup>3</sup> Bairat,<sup>4</sup> Rair and Gilund<sup>5</sup> provide evidence of the introduction of iron technology in Rajasthan. Among them, Balathal was the first where to understand its complex cultural sequence of the early historical period. It was noticed

during the course of excavation that the Iron Age habitants established their settlement right on top of the mound in the middle of 4<sup>th</sup> century BCE and flourished for about 700 years. Probably, it was in the industrial colony that supplied to the neighboring region.<sup>6</sup> After these findings at Balathal, Lalit Pandey conducted an extensive exploration of the surrounding region; the basic objective of the exploration was to find out the Iron Age sites in south-east Rajasthan because Ahar is located in the surrounding region, providing evidence for the earliest appearance of iron in 1300 BCE. During the course of exploration, the excavator identified various Iron Age and the Early Historical sites. These are located at Iswal, Bhojn-Ki-Pancholi, Bhinder and Nathara-Ki-Pal (all in Udaipur District). The objectives of the excavations at the sites of Iswal and Nathara-Ki-Pal were as follows:

1. To ascertain the expansion of iron working in the south-east of Rajasthan from the Early Historic to the Medieval period.
2. To establish a chronology of south-east of Rajasthan from Early Historical period.
3. To understand the temporal and spatial development of the furnace technology in order to understand the

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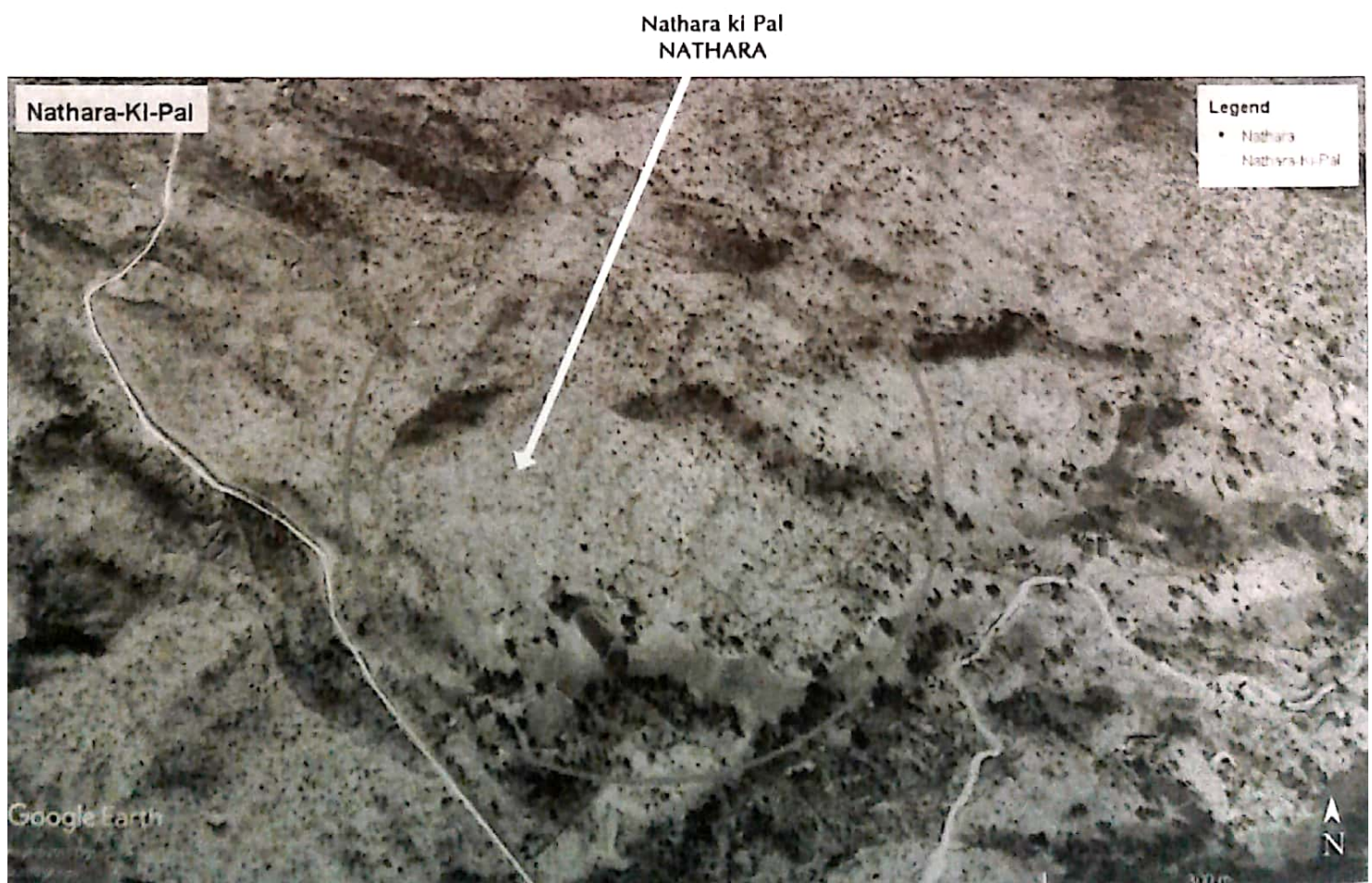
technology of the region. To understand the different technology applied such as iron technology, blacksmith technology and to know the skill of the smiths using different technologies.<sup>7</sup>

### Nathara-Ki-Pal

In 1944 the site Nathara-Ki-Pal was discovered by L.C. Shinde of the Institute of Rajasthan studies, Udaipur. During the course of the systemic survey of the region V.S. Shinde, Deccan College, Pune and Lalit Mohan Shastri, re-examined the site and it was observed that it was a potential centre of iron metallurgical activities from the Early Medieval to the Medieval period. The remains of broken retorts and the remains of the broken iron objects were significantly visible on the surface of the mound. The village Nathara ( $73^{\circ}47'E$ ;  $24^{\circ}16'N$ ) (Fig. 1) is located about fifty-seven km south-east of Udaipur. The site Nathara-Ki-Pal is at a distance of 4 km north-west of Chavand. Geographically, the village Nathara-Ki-Pal is located on the foot hills of Aravalli. The village is situated close to Gargal river, which originated from Nathara-Dhawaraghatas; it is a seasonal river. The total area of village is 5,527 hectares and spatially it is not only the largest 'Pal' (Tribal village) but also the largest

village in Magra (hilly tract). The site of Nathara is spread in an area of 1 km (NS) X 0.5 km (EW). The heaps of iron slags can be seen on the surface of the mound which shows that it was a major center of iron metallurgical activities. The site is in close vicinity of iron ore. The iron ore is located on a hill at a distance of 1.5 km in the north-west direction. Locally, the hill is called Beghata. According to the report of Department of Mines and Geology of Government of Rajasthan, Nathara has a good amount of iron deposit and the iron content in it ranges from 48% to 62%.<sup>8</sup>

The excavations at Ahar, Balathal and at Isapur have provided the ample evidence of iron metallurgical activities which range from 400-BCE to 14<sup>th</sup> century CE. It was, therefore, decided to excavate more sites of iron metallurgical activities. Factors like distinct geographical location and rich deposits of iron ore were the major cause to initiate excavation at Nathara-Ki-Pal. The region of Nathara has the thick tribal population even a late Medieval cultural sequence in this zone of south Rajasthan. During the course of exploration of the neighboring region of the site within a periphery of 10 km, it was observed that during the early Medieval period the region had developed as a potential zone of so





economic activities. The region which is traditionally known as "CHCHAPAN", is rich in Zinc, Lead, Silver and Iron. Early Guhilas established their capital at present Kalyanpur (Kishkindha). The four inscriptions of 7<sup>th</sup> century CE, found at Kishkindha testifies its political importance. Probably, the local Bhil community had friendly relations with Guhilas which enabled them to establish their rule. The first season's excavation clearly demonstrates that the main occupation of the early settlers was iron smelting and working. A huge outer enclosure wall also suggests that Nathara-Ki-Pal was politically or socio-economically a major centre. Further excavation will reveal the culture sequence of this zone of Mewar because no attempt has been made so far to study it from the point of archaeology. Zawar is the only site of the region which provides potential evidence of zinc metallurgy and Kalyanpur is known as the treasure house of classical and Medieval stone sculptures.

### Excavation

To fulfill the above objectives four trenches TT1, TT2, TT3, TT4, TT5 and TT6 were laid down in the north-east direction. All these trenches were divided into four quadrants i.e. SW, SE, NE and NW and the separate lot number given to each quadrant for digging (Pl. 1).

### Structure

During the course of excavation, it was observed that the habitants had constructed a rampart to safeguard the settlement either from flood or invasions. The rampart comprises outer and inner walls. Probably the outer wall has survived only in the north-south corners in the form of bastions. The northern bastion of the outer wall is surviving up to a length of 6.20 m only in north-south direction with a total width of 90 cm. Its total height was 1.60 m. The 17 courses were clearly visible on the surviving wall. The southern bastion was found in dilapidated condition. Its surviving height measured 10.5 m, width of 1.10 m. The total length of an outer wall of the rampart from the north to south bastion measures 25.10 m. The inner wall of the rampart is constructed at a gap of 2m from the outer wall. The gap between the outer and the inner wall is filled with mud, pebbles and iron slags and it is perfectly rammed. The inner wall of the rampart also runs from north to the south direction but it could be exposed only in NE quadrant of TT1, NW quadrant TT3, TT4 and TT5, its surviving length in the TT1 measured 1.83 m. During the excavations, it could be recovered only in TT3, TT4 and TT5 trench with a measurement of 5 m. Its total surviving height is 1m with

a 70 cm. width and eleven courses. In TT5, the inner wall of the rampart consists of an E-W wall of 5 m length with a height of 1 m. Its total width is 60 cm. The total 8 courses are also seen in the length of the wall. The inner wall of the rampart continues from layer 1 to 3.

During the course of excavation, few living structures are exposed. They are rectangular in shape; probably the windows and entrance gates were also constructed by the habitants. In SE and SW quadrant of TT1, an entrance is also observed which is about 1m in length and it comes from layer 1. In addition to this, a floor was also noticed in SE, SW and NW quadrant of TT3 in layer 3. It was made of large stone slabs. The average size of the slabs is 70x65x9 cm. In NE quadrant of TT3, a platform of 1.40x90x45 cm was also exposed (Pl. 2).

### Pottery

The pottery, which is found at Nathara-Ki-Pal, can be categorised into two phases (i) Post-Kushan and (ii) Early Medieval. The pottery mainly comprises of red ware of fine and coarse fabric. The coarse variety of red ware has been found in abundance, the major shapes of red ware include storage jar. The fine variety of red ware includes spouted medium sized jars and *handis*. All are well-fired and some of the body sherds consist of floral designs. Most of the red ware sherds are plain and micaceous. There are few sherds only in which the traces of slip can be noticed. Red ware is the major pottery of the site which is found from 1 to 12 layers. Grey ware is found in a low percentage in the course and fine ware from 1 to 7 layers. The fine grey ware is well-fired and burnished. The upper parts of the sherds have varied designs of wavy lines, parallel lines and comb-like designs. A broken deep dish was recovered from trench no. TT3, belonging to layer 6. It has incurved rim with groove marks on the outer surface of the rim (Pl. 3).

### Antiquities

The coins were recorded during second season (2006-2007). They are Indo-Sassanian coins. All coins are circular in shape; the diameter varies from 14 mm to 17 mm with an average thickness of 2 mm. The average weight is about 3.75 gram. A preliminary examination shows that coins contain about 60% silver. The other remaining metals are copper and zinc. Other antiquities include shell bangle, perforated bone bead, terracotta figurines, iron nail and one brass ring; the ring is blue in colour and opaque in nature. Terracotta lamps were also



recovered which are quite deep and have a prominent base.

### **Furnace**

The remains of a furnace were recovered in SE quadrant of trench TT2 at a depth of 3.10 m in layer 6. The furnace was totally broken; therefore, it is not possible to predict its shape. During the course of excavation, only the base of the furnace could be recovered which is 15m thick and it is circular in shape. During the cleaning of TT2, a broken retort is recovered from layer 6; it is noteworthy that the base of the furnace was also recovered from layer 6. The total length of the retort is 26 cm and the width of 11 cm. There are two holes on both ends; one is larger (4.5 cm) and the other smaller (3 cm). The larger hole runs along the length of the retort. In course of it, the narrow hole of the retort is horizontal. The retort found at Nathara is absolutely different from the ones recovered at Iswal. It shows certain kind of variation in technological terms (Pl. 4).<sup>9</sup>

### **Conclusion and Observation**

All these structure, antiquities and potteries belong to the early Medieval to the Medieval period. It appears that from point of view of material culture the settlement was not so prosperous. During the course of exploration of the neighboring region of the site within a periphery of 20 km, it was observed that during the early Medieval period the region developed as a potential zone of socio-political activities. The Basic reason which is traditionally known as 'CHCHAPAN' is rich in Zinc, Lead, Silver and Iron. The early Guhilas established their capital at present Kalyanpur (Kishkindha). The four inscriptions of 7<sup>th</sup> century CE found at Kishkindha testifies to its political importance. The first season's excavation provides evidence that the major purpose of the early settlers was iron smelting and melting. A huge outer enclosure wall also suggests that Nathara-Ki-Pal, was politically or socio-economically a major centre. Further excavation will reveal the cultural sequence of this neglected zone of Mewar because no attempt has been made so far to study it from the point of view of archaeology. Zawar is the only site of the region which provides the potential evidence of Zinc metallurgy and Kalyanpur is also known as the treasure house of classical and Medieval stone sculptures.

During 2007-2008, excavation could not be conducted properly for a long time because the local Bhils of the region were quite offensive in the beginning. But later on, the excavation team could manage them with the help of the local tribal leaders. In addition to this, the site was in private possession and they granted permission for excavations eventually.

These studies indicate that both these sites were of great potential for research in iron technology and the sites are also significant to understand whether there was any similarity or difference in ways of making the furnace, firings and in tool types.

The structures of furnace are basically round in shape and are mostly made up of red soil with a mixture of milky quartile stones. These sites bear rich evidence of iron technology in the form of numerous furnaces and number of different types of slag. The sites were not areas where iron tools were marked or traded by and were important centre of iron production of different tools and artifacts. Further, the authors observed that these two sites were also well established in brass and steel production.

Thus, south-east Rajasthan was a very prominent centre of metallurgy in the past. It is unfortunate to note that the site of Nathara-Ki-Pal is completely destroyed by local farmers and roadways and in the case of Iswal also half the portions were destroyed by highways.

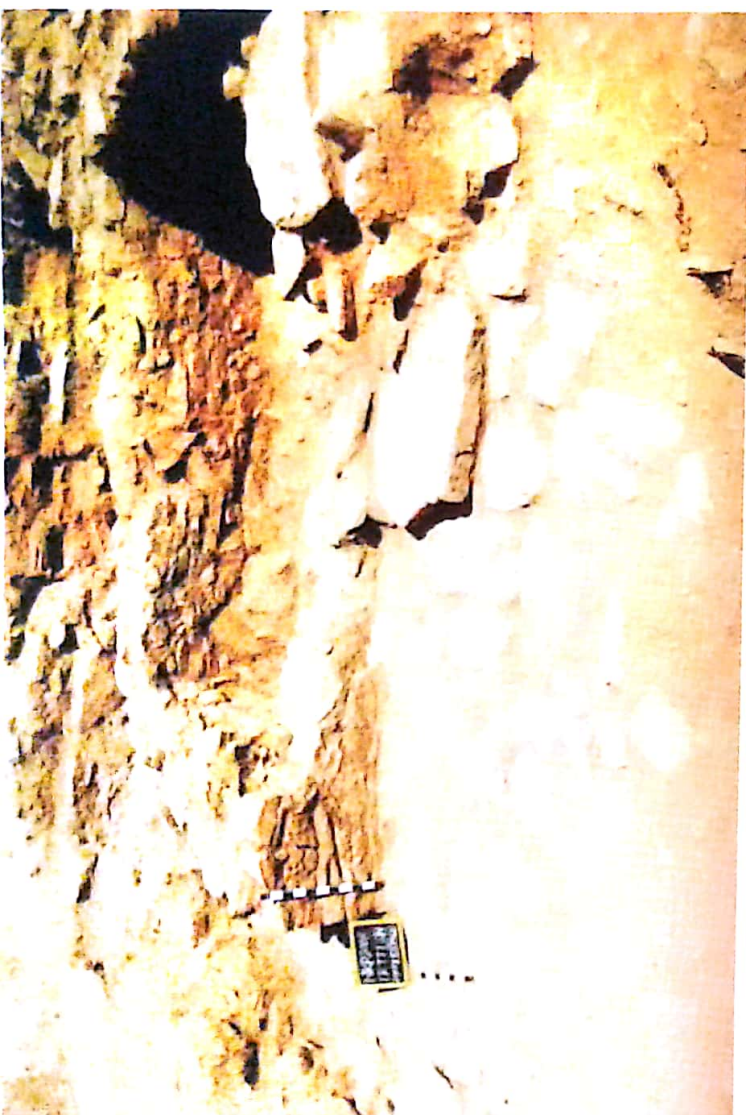
### **Acknowledgments**

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Kumar *et al.*, Pl. 1: General view of a trench in Nathara-Ki-Pal





